T10
INTEGRATED PEST MANAGEMENT

T10.001
Control of Thrips with Microbial Bioinsectides Based on the Entomopathogenic Fungus *Metarhizium anisopliae*

Leland, J. E.

NOVOZYMES BIOLOGICALS, 5400 CORPORATE CIRCLE, 24153, SALEM, VA, UNITED STATES

The entomopathogenic fungus *Metarhizium anisopliae* strain F52 is currently sold in the U.S. as Met52 and in Europe as Bio1020 for the control of black vine weevil in hardy nursery stock and berries. Products based on this isolate are currently under development in North America and Europe for a wide range of insect pests. Options for the effective control of thrips have become limited due to a reduction in available active ingredients from regulatory restrictions and insecticide resistance. Thrips are therefore an attractive target for the development of products with a new mode of action. An emulsifiable concentrate formulation based on *M. anisopliae* strain F52 is being developed for control of foliar and soil-dwelling life stages of thrips. The formulation has demonstrated consistent efficacy against thrips in a range of fruit, vegetable, and ornamental crops. Use patterns are currently being refined including application timing, placement, compatibility with beneficials, and rotation with insecticides. These new products offer an attractive new tool for the integrated pest management and resistance management of thrips.

T10.002
An Innovative Approach to Reduce Chemicals in Mite Control

Martin, T.[1]; Komlan, F. A.[2]; Sidick, I.[3]

[1]CIRAD - UNITÉ DE RECHERCHE HORTSYS, TA B-103/PS4 - BOULEVARD DE LA LIRONDE, 34398, MONTPELLIER, FRANCE

[2]INRAB, BP 03 1555, COTONOU, BENIN

[3]CREC, 06 BP 2604, COTONOU, BENIN

The efficacy of an innovative technique using acaricide treated nets was recently demonstrated to control phytophagous mites on vegetables. The net impregnated with the acaricide dicofol was efficient against the broad mite *Polyphagotarsonemus latus* (Banks) and spider mites (*Tetranychus* spp.) when used temporarily (once every three nights) covering eggplant. The technique was evaluated with chlorpyriphos ethyl impregnating nets in southern Benin. Results showed that the populations of *Tetranychus urticae*, and *T. ludeni* in the first trials and the invasive specie *T. evansi* in a last trial were significantly controlled by this technique. Very few mites were observed on plants covered with the acaricide treated net compared with very high densities on leaves in the unprotected control plots. This new concept of mite control using an acaricide-treated net temporarily covering vegetable crop appears to be an efficient tool which is easy to use by small-scale farmers. With this technique the pesticide remains on the material reducing the risk of plant contamination and environmental pollution. Thus the same treatment can be applied many times reducing chemicals for controlling mites. In greenhouses, particularly where populations of mites can increase rapidly on vegetables or ornamental flowers acaricide-treated nets could be used to control outbreaks just before the prompt release of useful insects as is permitted by absence of pesticide residues on plants with this innovative technique. In Sub-Saharian countries where mite outbreaks are observed mainly in the dry season the application of acaricide treated net poses a very low risk of pesticide workout by rain reducing the risk of pesticide residues on plants and their negative impact on useful insects.

T10.003
Towards Improved Control of Woolly Apple Aphid (*Eriosoma lanigerum*) in Integrated Fruit Production

Belien, T.; Bangels, E.; Peusens, G.

PCFRUIT VZW, FRUITTUINWEG 1, B-3800, SINT-TRUIDEN, BELGIUM

Since the withdrawal of certain insecticides and the restricted use of some broad-spectrum plant protection products, the woolly apple aphid (*Eriosoma lanigerum*) has become one of the most severe pests in apple growing areas across Western Europe. Their protective wax coating makes them particularly difficult to control. At present, effective limitation of woolly aphid populations relies on a good synergy between chemical control treatments and biological suppression by beneficial insects. Optimal control strategies take advantage of a thorough understanding of the life cycle of woolly apple aphids, the timing of their migration waves and their interaction with the environment. Based on an extensive amount of monitoring data and research results (efficacy trials, side effects trials, field population dynamics of beneficials) we here present optimal treatment schedules for this pest. These integrated pest management programs not only take into account the efficacies of low-impact insecticides, but also their optimal timing of application. The perfect tuning of treatment schedules is important with regard to a maximal contribution of beneficial predators and parasitoids. In addition, the potential implementation of new alternative biological control methods is discussed.

T10.004
Ecology of *Tuta absoluta* (Meyrick), the New Invasive Pest of Tomato

Vercher, R.[1]; Guenaoui, Y.[1]; Calabuig, A.[2]; Felipe, C.[2]; Ghelamallah, A.[1]

[1]INSTITUTO AGROFORESTAL DEL MEDITERRÁNEO. ETSIA (UPVV), CAMINO DE VERA 14, 46022, VALENCIA, SPAIN

[2]DEPARTEMENT D´AGRONOMIE, UNIVERSITÉ DE MOSTAGANEM

Tuta absoluta (*Lepidoptera: Gelechiidae*) is a new invasive pest in Europe and North Africa. It´s area of origin is South America. It is a moth whose larvae cause important damage to the plant leaves, and even more damages to the fruit itself, feeding from it and causing it to be commercially unfit. Usual crop losses in affected orchard range from 60 to 90%. This work discusses the insect invasion progresses in Europe and African continent since it was first detected in the summer of 2007 in Castellón (Spain). This pest is a clear case of pest with a high level of invasion and causing serious ecological and environmental damage in the area of invasion. Ecological impact is related to the increase in pesticide use in affected areas: many tomato-producing areas have multiplied pesticide treatments made in cultivation, increasing environmental pollution or the occurrence of secondary pests. Further studies have been conducted to determine the behavior and ecology of the pest in our environmental conditions, different from its area of origin. The range of host plants was analyzed, as well as egg laying preferences and larva feeding preferences, showing various trends. Finally, data related to treatment thresholds and field levels of damage are presented and analyzed.

T10.005
Spatial and Temporal Associations of Powdery Mildew and Two-Spotted Spider-Mite in Greenhouses

Bout, A.[1]; Muller, M.[1]; Mailleret, L.[1]; Boll, R.[1]; Senoussi, R.[2]; Poncet, C.[1]

[1]INRA, UR880, URIH, F-06903 SOPHIA-ANTIPOLIS, FRANCE

[2]INRA, UR0546, BIOSTATISTIQUE ET PROCESSUS SPATIAUX, F-84914 AVIGNON, FRANCE

Chemical pest management has been intensively implemented in greenhouses in order to guarantee high yields and quality of the marketable products. Over the last decades, new crop protection strategy, e.g. Integrated Pest Management (IPM) has emerged as the dominant alternative to conventional pesticides. This strategy involves the combined use of multiple pest control methods which informed both